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ABSTRACT

Some exercises are misused and abused by people of all ages, and increased age magnifies the bad effects of these exercises. Senior citizens in particular should be aware of the possible damage that some exercises, particularly when done unsupervised, pose to their physical health. This paper describes 56 common exercises and alternatives to those that are identified as dangerous to the areas of the head and neck, back, abdominal muscles, arms, hips, knees, and ankles. (CB)

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"IF I KNEW THEN WHAT I KNOW NOW- EXERCISE CAUTIONS"

by
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(presented at Council on Aging and Adult Development Pre-Convention Workshop, AAHPERD National Convention, April 13, 1987)

If I knew then, what I know now, I wouldn't have given my real estate agent wrong advice. It was in the late 60's and she was a thin willowy woman about age 65. She wanted to get rid of her flapping arms. I prescribed a progression of triceps strengthening exercises which she performed faithfully for several weeks. She did get stronger, but the flapping skin layer remained. I did not know enough then about aging to recognize that it was atrophy of the subcutaneous skin layers, as opposed to muscle atrophy - and of course exercise could not change sagging skin.

If I knew then what I know now, I might not be limping from osteoarthritis of the hip and knee from abusing my body in training - and I might not have done those exercises and stunts that left me with a literal pain in the neck! I am still learning about the effects of aging on the body and about exercise. But I have learned enough to recognize that *some exercises are misused and abused (at all ages),* and that *increased age magnifies the bad effects of those exercises.*

I will share with you a few contraindicated exercises, which I will label "NO" on the slides; I will briefly explain why they are not recommended and suggest some alternative exercises which I will label "YES" on the slides.

WE will start with the head and neck, and work down:

NO

1. **Neck hyperextension** is seen in a lot of exercises. One of the more common forms is "head rolling" or neck circling".
2. **Cervical spine model:** Here is shown a model of the cervical spine. The vertebral artery is shown where it hooks around the lateral process of the atlas and the nerve roots are shown where they exit between the vertebrae through the intervertebral foramina.

When the neck is hyperextended, as in this slide, the intervertebral foraminal openings are narrowed, predisposing the nerve roots to impingement. This is true at any age, but particularly in those with pathological changes in the spine. One study shows that 87% of men and 74% of women have radiographic evidence of cervical disc degeneration.

3. **Picture of cervical spine** (Williams 1974)- this picture illustrates the loss of height of the discs, especially between the 5th and 6th vertebrae. You may be able to see the narrowed foramen , and the degenerated facet joint which is labeled here as being dislocated. Facet joints are more prone to osteoarthritic changes than any other joint in the body. You may also be able to see the bone spurs. Bone spurs also occur in the facet joints and in the foramen. They are called osteophytes and they make the opening even smaller.

As the discs degenerate, the neck gets shorter and the vertebral arteries may get "kinked" because they are now longer than the neck - then when you tip your head back, it occludes the artery and you get dizzy. It is what Shepherd (1978) calls "the drop attack" because some people faint. There may be pain, nausea, weakness, tingling or numbness in the head and

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arms. Trigger points in the neck and upper back will be activated. (Travell 1983) Turning the head while it is fully extended can also narrow the vertebral artery.

Forward head posture increases the cervical lordosis and can lead to degeneration spondylosis as can circling the head and neck.
We need to do ***axial extension,*** that is, pull the chin in and push the head up, flattening the cervical curve. Rotation exercises are good , but this Harvard Lampoon may have carried it a little too far.....!

4. "Cervical Dislocation" (Exercise Cartoon) - by recommending... "three revolutions clockwise; hold and relax and repeat 3 revolutions counterclockwise!" An even better way to do that is shown in the next slide:

YES

5. P.N.F. neck exercise - Perform light resisted rotation to the right then relax and turn the head unassisted to the left, etc. Lateral flexion, flexion, and extension can be done with light self resistance without the need to hyperextend.

NO

6. The Yoga Plough or bicycling from a shoulder stand with most of the weight on the cervical vertebra is very poor! It stretches the cervical and thoracic ligaments, leading to faulty posture, compresses the discs and compresses the heart and lungs.

Any exercise which hyperflexes the neck is contraindicated because of this. Disc compression may lead to disc degeneration. Hyperflexion and rotation narrows the vertebral artery. Contrary to what Yoga experts may tell you, this position does not stimulate the gonads and if it is intended to relieve swollen legs, there are better ways to elevate the legs.

BACK

Studies show that 60% of men and 44% of women over the age of 35 show degeneration of the lumbar discs. And between the ages of 55-64, 87% of women and 83% of men have osteoarthrosis. (Shepherd 1978)

NO

7. Back hyperextension (prone)- like hyperextension of the neck narrows the intervertebral foramina and osteophytes from arthrtic changes in the spine narrow the canal even more.

NO

8. Back hyperextension (standing))- back circling is also contraindicated. Trauma and compression as well as normal aging cause a loss of water in the disc and makes it more susceptible to degeneration and tears. (Basmajian 1985)

Lumbar lordosis should be avoided during weight lifting and strength training excercises. High heeled shoes should be avoided because they contribute to lordosis.

9. Lumbar spine hyperextended- this model is hyperextended and the foramina can be seen to be impinging on the nerve roots. The nucleus pulposus of the fifth lumbar disc is seen to be herniated in this picture. There is also an impingement of one spinous process on another - this may cause pain and is apt to happen if the discs are degenerated causing a diminshed joint space.

10. Lumbar vertebra with arthritic changes - note the bone spurs, called "lipping", and the hour-glass shape of the body of the vertebra. Such osteophytic enlargement of the articular processes and thickening of the lamina can narrow the spinal canal and cause central as well as lateral stenosis of the cord and nerves. (Basmajian 1985)

NO

11. Prone back extension - can be done to strengthen the back muscles without arching the back and lower back and hip extensors can be exercised as shown in this next slide.

YES

12. Leg lift backward without hyperextension.

NO

13. Bend and twist - Fisk (1977) says that in low back pain, patients invariably give a history of twisting and bending; this puts tremendous torsional strain on the spine, especially the facet joint capsule. Cailliet (1977) believes you should never extend and rotate the spine at the same time, because it violates the so-called normal "lumbar rhythm" and causes disc injury.

Our seniors should be taught to never bend over and lift or pull something with the back twisted and to never get up or sit down in a chair while leaning forward in the stooped position with the trunk rotated. (Travell 1983)

ABDOMINAL

NO

14. Double leg lift - This is one of the worst exercises invented. It is usually prescibed for lower abdominal strengthening. The next exercise is similar and almost as bad...

NO

15. Straight leg sit-up. (Notice the hands pulling on the neck during this sit-up, causing hyperflexion and possible neck injury). The straight leg sit-up is usually prescribed for upper abdominal strengthening, but the abdominals are not the prime movers in either of these exercises! Rather, it is...

16. The iliopsoas muscle group which cause flexion at the hip. As shown here, it attaches to the lumbar vertebrae and when it contracts it causes severe compressional force on the lumbar discs and produces a torque which tends to make the lower back hyperextend.

Lordosis may be countered by strong contractions of the abdominals, but the abdominals can not prevent the compressive force - in fact they contribute to it!. It is bad for anyone, but particularly for seniors because of the complications of degenerated discs and arthritic changes in the spine.

YES

17. Reverse curl - This supine reverse curl-up in which the knees are brought to the chest and the tail bone is lifted off the floor is a better alternative to strengthen the lower abdominals.

YES

18. Crunch - For abdominal strengthening the "curl" or "crunch" is preferred for those who can perform it; notice the hands are placed on the

cheeks (or you could stick your fingers in your ears) to prevent hyperflexion of the neck.

YES

19. Cat backs - For those too weak to do crunches and reverse curls, pelvic tilts such as this "cat-back" exercise, may be used to contact the abdominals. Care must be taken to avoid strong isometric contractions when doing this (as we will discuss later).

NO

20. Double leg-lifts in a chair - are easier than supine ones but have the same problems of producing back strain.

YES

21. Single leg-lift in a chair - for the frail person who needs to exercise in a chair, single leg-lifts can elicit lower abdominal contractions to stabilize the pelvis and also some stabilizing action of the spinal muscles and the opposite leg extensors.

BAIANCE BOARDS

NO

22. Balance board- this is a good exercise but as shown it is dangerous because there is no one spotting. The elderly tend to have balance problems and need some balance training, but it should be done with close supervision and safety.

ARMS

NO

23. Isometric chest developer- this won't increase the size of the bust, but it may develop the pectorals; however, isometric exercises in the elderly population, particularly those with heart disease or hypertension, may be hazardous because it markedly elevates the diastolic blood pressure and may cause heart irregularities-- this NEXT SLIDE...

24. "Pectoral Hemmorrhage" exercise from the Harvard Lampoon might be a better way to put up a big front.

NO

25. Heavy weight lifting - is not advisable for the elderly because tendons may rupture and bones fracture. Furthermore, the participant must be taught to breathe normally and avoid the ***val salva maneuver*** - particularly if they have cardiovascular problems. Lifting heavy weights can lead to injury as shown in the next slide.

26. Biceps tendon rupture is shown here. This can easily happen in the elderly. Also seen is a *tendon dislocation* where the tendon has slipped out of the bicipital groove. As we get older, the tuberosities wear down, leaving the groove shallower and distorted or even obliterated..
The absorption of the tuberosities may also permit compression of the biceps tendon by other structures.

The subacromial bursa is also caught in this compressive force, and may thicken and produce a calcium deposit. Cailliet believes aging is a significant factor in degenerative tendonitis. (Cailliet 1981)

YES

27. Triceps backward lift - Strength work is needed but it is not necessary to use maximum resistance. Here is a standing backward arm

lift using a homemade weight (a detergent bottle filled with sand).

YES

28. Latex tubing arm exercise - Latex tubing and "therabands" can be used for resistance exercise and are readily available in medical supply houses.

NO

29. Arm circles palm down - If "arm circles" or circumduction of the shoulder joint is used, it should **not** be done with the palms turned downward. The next slide will illustrate the reason.

30. Shoulder impingement - When the arm is abducted 90 degrees or more in internal rotation, the greater tuberosity impinges on the coracoacromial ligament, as shown in this picture (Lucas 1973)
This kind of movement or elevating the arm overhead while in a forward flexed or dorsal kyphotic position can tear the joint capsule and stretch or impinge the rotator cuff muscles and compress the subacromial bursa. (Cailliet1977). In the fifth decade, many cuffs are noted to be pulling away from their insertions and showing signs of thinning. Aging impairs the joint range of motion because of the altered postion of the scapula and dorsal kyphosis, decreasing the range of motion in the shoulder joint as much as 50 degrees, making impingement even more likely. (Calliet 1981)

YES

31. Palms-up arm circling - The palms should be turned up (supinated), externally rotating the greater tuberosity under the acromion.
The exercise is best done seated to isolate the action and prevent compensating movements in the pelvis. If arm circles are used, they *should be done backwards only*, to emphasize the stretch on the pectorals and contraction of the rhomboids, rather than forward, which tends to promote the round shouldered position.

HIP

NO

32. Side lying leg-lifts with an ankle weight - This exercise can be useful to strengthen the hip abductors, but done as illustrated, so the leg is *lowered completely to the floor* in to *hyperadduction*, Stevenson (1985) the hip may become subluxated, because of weak musculature and ligaments and arthritic changes in the joint. The ankle weight increases the likelihood of subluxation

33. Arthritis of the hip- This slide shows the degenerative changes possible in osteoarthritis. In this particular patient it should give you reason to doubt the advisability of jogging for cardiovascular fitness, as well as suggest why hyperadduction with a weight is hazardous.

YES

34. Side lying leg lowering with a pillow - Side lying leg-lifts can be good exercises if the leg is lowered to a pillow or some other support and *not* allowed to drop below the level of the acetabulum as shown in this slide.

NO

35. Quadriceps stretch (standing)- This commonly used exercise, in which the knee is bent and the foot is pulled up toward the buttocks, may stretch the quadriceps but as commonly performed and as demonstrate in

this slide, the knee is *hyperflexed* and this can be damaging to the knee joint. As illustrated here, it does not stretch the iliopsoas, which is the hip flexor most in need of stretching.

36."Vertebral Suspension" - now this Harvard Lampoon exercise has possibilities if you can do it -because the knee is only flexed to 90 degrees!

NO

37. Supine knee hyperflexion - This single knee-to-chest exercise is designed to stretch the hip flexors on the opposite side of the raised leg and to stretch the lower back muscles; however, the position of the hands as they pull down on top of the shin, *hyperflexes* the knee and tends to wedge it open with a dislocating force, possibly stretching the joint capsule, compressing the patella and inuring other structures of the knee.

YES

38. Thomas Test - This is a similar exercise but is a better way to stretch the hip flexor .Grasping the left thigh is a better way to pull the knee to the chest without hyperflexing the knee; hanging the right leg off the table allows the knee to bend and increases the stretch on the iliopsoas. The subject should attempt to keep the right thigh on the table.

NO

39. Sitting knee hyperflexion- This sitting single knee-to-chest pull is another example of bad hand position causing knee hyperflexion.

YES

40.Sitting knee pull- Here is the correct version of the sitting knee-to-chest exercise which is used primarily to stretch the lower back. The thigh rather than the shin should be grasped to avoid knee hyperflexion.

KNEE

NO

41 Deep knee bend - The deep squat exercise is usually prescribed to develop the quadriceps and other knee extensors; older people usually are weak in these muscles and have difficulty getting up and down stairs and into and out of chairs. Notice the knee is flexed more than 90 degrees and the knees are not aligned over the feet, thus producing a torque on the knee.

42. Knee joint model - Squat exercises can stretch the joint capsule, wedge open the front of the knee with a dislocating force and tear the medial collateral ligament and attached meniscus. The ligament can be seen in this model and the femoral condyles are shown at the end of their forward glide position.

YES

43. Stand and kneel- Using a chair for balance, this senior citizen demonstrates kneeling on one knee, limiting the flexion at 90 degrees. She will alternate kneeling on one knee then the other for quadriceps and hip extensor strength and endurance. Notice she uses the back of the chair for support as a safety measure.

YES

44. Half squat - Another safe and effective exercise for knee and hip extensors is a half squat, limiting the knee flexion to 90 degrees. The chair is used for balance only.

YES

45. Lunge - Another safe and effective knee and hip extensor exercise is demonstrated here is stepping forward into a lunge position on alternate legs, limiting the knee bend to no more than 90 degrees and making sure the foot is aligned directly under the knee
YES
46. Backward leg lift - Standing and lifting the leg backward while leaning the trunk forward isolates the gluteus maximus and other hip extensors. This should be in the category of hip exercises but I included it here because it is important for getting up and down out of a chair.

Exercise programs for the elderly often concentrate on quadriceps strength, forgetting that the hip extensors are used in combination with the quadriceps. I suspect that much of the difficulty of getting up and down can be attributed to degeneration of the knee joint.
NO
47. Hurdler's stretch - This commonly used method of stretching the hamstrings places a valgus force on the knee joint of the bent leg, stretching the medial collateral ligament and may tear the medial meniscus; it may also cause myofascial strain in the groin region.
YES
48. Reverse hurdle - This is called the "back-saver "stretch by Cailliet (1977). It is a sitting toe touch with one leg bent. The bent leg may be and laterally rotated; the bent leg may be it takes the twisting force off the knee and it also takes stress off the lower back. Cailliet and others believe one should never do a bilateral hamstring stretch, but rather should always stretch only one at a time; the bent knee isolates the stretch to the hamstrings and prevents the stretch from occuring in the lumbar region .
NO
49. Standing toe touch - Toe touch tests might be passed by your students but that does not mean that tight structures are not present; one may have hyperflexibility in one body part that compensates for short muscles in another part. The standing toe-touch exercise not only stretches both hamstrings at the same time, but also stretches the back, producing considerable torque and compression. If the knees are kept straight, there is a tendency for the knee to hyperextend and cause damage to the knee joint. Additionally, the elderly may have *postural hypotension* and get dizzy when they return to a standing position after having bent over.
50. "The "Tibial Rupture" - This Harvard Lampoon version of the hamstring stretch is titled "Tibial Rupture". There is little doubt that it stretched the hamstring, but look out for that hyperextension!
YES
51. Supine single leg lift - A safe and effective hamstring stretch is performed in a supine position; One leg should be raised over the chest; the foot should be grasped (if possible) and the knee extended as much as possible. This exercise has an advantage over most other hamstring stretch exercises in that it does *not* promote kyphosis in the upper back
YES
52. Chair sitting toe touch - A safe exercise to stretch the lower back for the chair-bound or frail senior adult is touching the toes while seated; unfortunately, it also stretches the upper back. Keeping the head up can prevent dizziness.

NO

53. Heel sit - Kneeling and then sitting-back on the heels with the feet in plantar flexion stretches the dorsiflexors of the ankle. This exercise is sometimes used to alleviate shin splints. Most older people do not need these stretched but rather need them strengthened so they can pick up their feet better and be less apt to stumble. The exercise is included here because it is another example of the contraindicated hyperflexed position of the knees that we have discussed previously.

54. Follicular extension - We see this same knee position in this cartoon called the "Follicular Extension Exercise". Extending the hair is great for the scalp, but there are a lot of men who can not benefit from this exercise!

YES

55. Sitting dorsiflexion against resistance - This chair exercise uses the weight of the left foot on top of the right serves as resistance to strengthen the anterior shin muscles as the left ankle is dorsiflexed against the weight. Some stroke patients may not be able to do this, but it is an important exercise for most elderly.

Finally, I give you **one last exercise** which will strengthen most of the muscles in the body - it is a push-up, but rather than use the arms and risk a torn rotator cuff, I offer you...

56. "Lingual distension" - the tongue push-up. (cartoon)

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